their principles are involved in the operation of aircraft and knowledge of these principles is often necessary to make repairs. Courses that develop writing skills are also important, because mechanics are often required to submit reports.

FAA regulations require current experience to keep the A & P certificate valid. Applicants must have at least 1,000 hours work experience in the previous 24 months or take a refresher course. As new and more complex aircraft are designed, more employers are requiring mechanics to take on-going training, to update their skills. Recent technological advances in aircraft maintenance necessitate a strong background in electronics—both for acquiring and retaining jobs in this field. FAA certification standards also make ongoing training mandatory. Every 24 months, mechanics are required to take at least 16 hours of training to keep their certificate. Many mechanics take courses offered by manufacturers or employers, usually through outside contractors.

Aircraft mechanics must do careful and thorough work that requires a high degree of mechanical aptitude. Employers seek applicants who are self-motivated, hard-working, enthusiastic, and able to diagnose and solve complex mechanical problems. Agility is important for the reaching and climbing necessary for the job. Because they may work on the top of wings and fuselages on large jet planes, aircraft mechanics must not be afraid of heights.

As aircraft mechanics gain experience, they may advance to lead mechanic (or crew chief), inspector, lead inspector, or shop supervisor positions. Opportunities are best for those who have an aircraft inspector's authorization. In the airlines, where promotion is often determined by examination, supervisors sometimes advance to executive positions. Those with broad experience in maintenance and overhaul might become inspectors with the FAA. With additional business and management training, some open their own aircraft maintenance facilities. Mechanics learn many different skills in their training that can be applied to other jobs, and some transfer to other skilled repairer occupations or electronics technician jobs.

Job Outlook

The outlook for aircraft mechanics should be favorable over the next 10 years. The small numbers of young workers in the labor force, coupled with few entrants from the military, and a large number of retirements point to good employment conditions for students just beginning training.

Job opportunities are likely to be the best at small commuter and regional airlines, FAA repair stations, and in general aviation. Because wages in these companies tend to be relatively low, there are fewer applicants for these jobs than for jobs with the major airlines. Also, some jobs will become available as experienced mechanics leave for higher paying jobs with airlines or transfer to another occupation. Mechanics will face competition for large airline jobs, because the high wages and travel benefits for these jobs attract more qualified applicants than there are openings. Prospects will be best for applicants with significant experience. Mechanics who keep abreast of technological advances in electronics, composite materials, and other areas will be in greatest demand. The number of job openings for aircraft mechanics in the Federal Government should decline, as the size of the Armed Forces is reduced.

Employment of aircraft mechanics is expected to increase about as fast as the average for all occupations through the year 2008. A growing population and rising incomes are expected to stimulate the demand for airline transportation, and the number of aircraft is expected to grow. However, employment growth will be restricted somewhat by increases in productivity, resulting from greater use of automated inventory control and modular systems that speed repairs and parts replacement.

Most job openings for aircraft mechanics through the year 2008 will stem from replacement needs. Each year, as mechanics transfer to other occupations or retire, several thousand job openings will arise. Aircraft mechanics have a comparatively strong attachment to the occupation, reflecting their significant investment in training and a love for aviation. However, because aircraft mechanics' skills are transferable to other occupations, some mechanics leave for work in related fields.

During recessions, declines in air travel force airlines to curtail the number of flights, which result in less aircraft maintenance and, consequently, layoffs for aircraft mechanics.

Earnings

Median hourly earnings of aircraft mechanics and service technicians were about $18.30 in 1998. The middle 50 percent earned between $14.91 and $22.12. The lowest 10 percent earned less than $11.92 and the highest 10 percent earned more than $24.40. Median hourly earnings in the industries employing the largest number of aircraft mechanics and service technicians in 1997 were:

Air transportation, scheduled	$20.80
Federal government	17.40
Air transportation, nonscheduled	15.40
Aircraft and parts	15.20
Airports, flying fields, and services	14.60

Mechanics who work on jets for the major airlines generally earn more than those working on other aircraft. Airline mechanics and their immediate families receive reduced fare transportation on their own and most other airlines.

Almost one-half of all aircraft mechanics, including those employed by some major airlines, are covered by union agreements. The principal unions are the International Association of Machinists and Aerospace Workers and the Transport Workers Union of America. Some mechanics are represented by the International Brotherhood of Teamsters.

Related Occupations

Workers in some other occupations that involve similar mechanical and electrical work are electricians, electronic equipment repairers, and elevator repairers.

Sources of Additional Information

Information about jobs in a particular airline can be obtained by writing to the personnel manager of the company. For general information about aircraft mechanics, write to:

☛ Professional Aviation Maintenance Association, 636 I St. NW., Suite 300, Washington, DC 20001.

For information on jobs in a particular area, contact employers at local airports or local offices of the State employment service.

Automotive Body Repairers

(O*NET 85305A, 85305B, and 85305C)

Significant Points

- Many still learn this trade on the job as helpers, although employers prefer to hire persons with automotive body repair training.
- Good reading and basic mathematics skills are needed to follow instructions and diagrams in technical manuals.

Nature of the Work

Thousands of motor vehicles are damaged in traffic accidents every day. Although some of these vehicles are sold for salvage or scrapped, most can be repaired to look and drive like new. Automotive body repairers straighten bent bodies, remove dents, and replace crumpled parts that are beyond repair. They repair all types of vehicles but mostly work on cars and small trucks, although some work on large trucks, buses, or tractor-trailers.

When a damaged vehicle is brought into the shop, body repairers generally receive instructions from a supervisor who determines which parts to restore or replace and how much time the job should take.

Automotive body repairers use special equipment to restore damaged metal frames and body sections. Repairers chain or clamp frames and sections to alignment machines that use hydraulic pressure to align damaged components. "Unibody" vehicles, designs built without frames, must be restored to precise factory specifications for the vehicle to operate correctly. To do so, repairers use bench systems to make accurate measurements of how much each section is out of alignment and hydraulic machinery to return the vehicle back to its original shape.

Body repairers remove badly damaged sections of body panels with a pneumatic metal-cutting gun or by other means and weld in replacement sections. Repairers pull out less serious dents with a hydraulic jack or hand prying bar or knock them out with handtools or pneumatic hammers. They smooth out small dents and creases in the metal, by holding a small anvil against one side of the damaged area, while hammering the opposite side. They also remove very small pits and dimples with pick hammers and punches in a process called metal finishing.

Body repairers also repair or replace the plastic body parts used increasingly on new model vehicles. They remove damaged panels and identify the family and properties of the plastic used on the vehicle. With most types of plastic, repairers can apply heat from a hot-air welding gun or by immersion in hot water and press by hand the softened panel back into its original shape. They replace plastic parts that are badly damaged or very difficult to repair.

Body repairers use plastic or solder to fill small dents that cannot be worked out of the plastic or metal panel. On metal panels, they file or grind the hardened filler to the original shape and clean the surface with a media blaster before painting. In many shops, automotive painters do the painting. (These workers are discussed in the *Handbook* statement on painting and coating machine operators.) In small shops, workers often do both body repairing and painting. A few body repairers specialize in repairing fiberglass car bodies.

In large shops, body repairers may specialize in one type of repair, such as frame straightening or door and fender repair. Some body repairers specialize in installing glass in automobiles and other vehicles. Glass installers remove broken, cracked, or pitted windshields and window glass. Glass installers apply a moisture-proofing compound along the edges of the glass, place it in the vehicle, and install rubber strips around the sides of the windshield or window to make it secure and weatherproof.

Body repair work has variety and challenges—each damaged vehicle presents a different problem. Using their broad knowledge of automotive construction and repair techniques, repairers must develop appropriate methods for each job.

Automotive body repairers use their broad knowledge of automotive construction and repair techniques.

Body repairers usually work alone with only general directions from supervisors. In some shops, helpers or apprentices assist experienced repairers.

Working Conditions

Most automotive body repairers work a standard 40-hour week, although some, including the self-employed, may work 60 or more hours a week. Repairers work indoors in body shops that are noisy, because of hammering against metal and the use of power tools. Most shops are well ventilated to disperse dust and paint fumes. Body repairers often work in awkward or cramped positions, and much of their work is strenuous and dirty. Hazards include cuts from sharp metal edges, burns from torches and heated metal, injuries from power tools, and fumes from paint. However, serious accidents are usually avoided, when the shop is kept clean and orderly and safety practices are observed.

Employment

Automotive body repairers held about 227,000 jobs in 1998. Most repairers worked for automotive repair shops. The next largest number of repairers worked for automobile and truck dealers specializing in body repairs and painting. Others worked for organizations that maintain their own motor vehicles, such as trucking companies and automobile rental companies. Some worked for motor vehicle manufacturers. About 1 automotive body repairer out of 6 was self-employed.

Training, Other Qualifications, and Advancement

Most employers prefer to hire persons who have completed formal training programs in automotive body repair, but these programs supply only a portion of employers' needs. Formal training is highly desirable, because advances in technology have greatly changed the structure, components, and materials used in automobiles. As a result, these new technologies require proficiency in new repair techniques and skills. For example, bodies of newer automobiles are increasingly made of a combination of materials—traditional steel, aluminum, and a growing variety of metal alloys and plastics—each requiring the use of somewhat different techniques to reshape and smooth out dents and small pits. Many high schools, vocational schools, private trade schools, and community colleges offer automotive body repair training programs. Formal training in automotive body repair can enhance chances for employment and speed promotion.

Employers also hire many persons without formal automotive body repair training. These workers learn the trade as helpers, picking up skills on the job from experienced body repairers. For helper jobs, most employers prefer to hire high school graduates who know how to use handtools. Good reading and basic mathematics and computer skills are essential to becoming a fully skilled automotive body repairer. Restoring unibody automobiles to their original form requires such precision that body repairers must follow instructions and diagrams in technical manuals to make very precise three-dimensional measurements of the position of one body section relative to another.

Helpers begin by assisting body repairers in tasks such as removing damaged parts, sanding body panels, and installing repaired parts. They learn to remove small dents and to make other minor repairs. They then progress to more difficult tasks, such as straightening body parts and returning them to their correct alignment. Generally, to become skilled in all aspects of body repair requires 3 to 4 years of on-the-job training.

Certification by the National Institute for Automotive Service Excellence (ASE), though voluntary, is the recognized standard of achievement for automotive body repairers. ASE offers a series of four exams for collision repair professionals twice a year. Repairers may take from one to four ASE Master Collision Repair & Refinish Exams. Repairers who pass at least one exam and have 2 years of hands-on work experience earn ASE certification. Completion of a post-secondary program in automotive body repair may be substituted for 1 year of work experience. Those who pass all four exams become ASE Master Collision Repair & Refinish Technicians. Automotive body repairers must retake the examination at least every 5 years to retain certification.

Continuing education throughout a career in automotive body repair is required. Automotive parts, body materials, and electronics continue to change and become more complex and technologically advanced. To keep up with these technological advances, repairers must continue to gain new skills, read technical manuals, and attend seminars and classes.

An experienced automotive body repairer with supervisory ability may advance to shop supervisor. Some workers open their own body repair shops. Others become automobile damage appraisers for insurance companies.

Job Outlook

Employment of automotive body repairers is expected to increase about as fast as the average for all occupations through the year 2008. Opportunities should be best for persons with formal training in automotive body repair and mechanics.

Demand for qualified body repairers will increase, as the number of motor vehicles in operation continues to grow in line with the Nation's population. With an increase in the number of motor vehicles in use, the number of vehicles damaged in accidents will also increase. New automobile designs increasingly have body parts made of steel alloys, aluminum, and plastics—materials that are more difficult to work with than traditional steel body parts. Also, new, lighter weight automotive designs are prone to greater collision damage than older, heavier designs and, consequently, more time is consumed in repair. The need to replace experienced repairers who transfer to other occupations, retire, or stop working for other reasons will account for the majority of job openings.

The automotive repair business is not very sensitive to changes in economic conditions, and experienced body repairers are rarely laid off. However, although major body damage must be repaired, if a vehicle is to be restored to safe operating condition, repair of minor dents and crumpled fenders can often be deferred during an economic slowdown. During this time, most employers will hire few new workers. In addition, recent business conditions have forced some small, unprofitable body shops to go out of business and have led some dealerships to consolidate body shops, in order to remain viable.

Earnings

Median hourly earnings of automotive body and related repairers, including incentive pay, were $13.18 in 1998. The middle 50 percent earned between $10.23 and $17.71 an hour. The lowest 10 percent earned less than $7.38, and the highest 10 percent earned more than $22.47 an hour. Median hourly earnings in the industries employing the largest number of automotive body and related repairers in 1997 were as follows:

New and used car dealers	$14.20
Automotive repair shops	12.80
Motor vehicles, parts, and supplies	11.40

The majority of body repairers employed by automotive dealers and repair shops are paid on an incentive basis. Under this method, body repairers are paid a predetermined amount for various tasks, and earnings depend on the amount of work assigned to the repairer and how fast it is completed. Employers frequently guarantee workers a minimum weekly salary. Body repairers who work for trucking companies, bus lines, and other organizations that maintain their own vehicles usually receive an hourly wage.

Helpers and trainees usually earn from 30 to 60 percent of the earnings of skilled workers. Helpers and trainees usually receive an hourly rate, until they are skilled enough to be paid on an incentive basis.

Some automotive body repairers are members of unions, including the International Association of Machinists and Aerospace Workers; the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; the Sheet Metal Workers' International Association; and the International Brotherhood of Teamsters. Most body repairers who are union members work for large automobile dealers, trucking companies, and bus lines.

Related Occupations

Repairing damaged motor vehicles often involves working on mechanical components, as well as vehicle bodies. Automotive body repairers often work closely with individuals in several related occupations, including automotive and diesel mechanics and service technicians, automotive repair service estimators, painting and coating machine operators, and body customizers.

Sources of Additional Information

Additional details about work opportunities may be obtained from automotive body repair shops and motor vehicle dealers; locals of the unions previously mentioned; or local offices of your State employment service. State employment services also are a source of information about training programs.

For general information about automotive body repairer careers, write to:

☛ Automotive Service Association, Inc., 1901 Airport Freeway, Bedford, TX 76021-5732. Internet: **http://www.asashop.org**

☛ National Automobile Dealers Association, 8400 Westpark Dr., McLean, VA 22102.

☛ Inter-Industry Conference On Auto Collision Repair Education Foundation (I-CAR), 3701 Algonquin Rd., Suite 400, Rolling Meadow, IL 60008. Telephone (toll free): 1-888-722-3787.
Internet: **http://www.i-car.com/foundation.html**

For information on how to become a certified automotive body repairer, write to:

☛ ASE, 13505 Dulles Technology Dr., Herndon, VA 20171-3421. Internet: **http://www.asecert.org**

For a directory of certified automotive body repairer programs, contact:

☛ National Automotive Technician Education Foundation, 13505 Dulles Technology Dr., Herndon, VA 20171-3421.
Internet: **http://www.natef.org**

For a directory of accredited private trade and technical schools that offer training programs in automotive body repair, write to:

☛ Accrediting Commission of Career Schools and Colleges of Technology, 2101 Wilson Blvd., Suite 302, Arlington, VA 22201.

For a list of public automotive body repair training programs, contact:

☛ SkillsUSA-VICA, P. O. Box 3000, 1401 James Monroe Hwy., Leesburg, VA 22075. Telephone (toll free): 1-800-321-VICA.
Internet: **http://www.skillsusa.org**

Automotive Mechanics and Service Technicians

(O*NET 85302A and 85302B)

Significant Points

- Opportunities are expected to be very good for persons who complete formal automotive training programs.
- Automotive mechanics and service technicians must be well versed in electronics and mathematics to work on increasingly sophisticated car components and systems.

Nature of the Work

Automotive mechanics and service technicians inspect, maintain, and repair automobiles and light trucks, such as vans and pickups, with gasoline engines. Traditionally, these workers have been called "mechanics." The increasing sophistication of automotive technology now requires workers who can use computerized shop equipment and work with electronic components, while maintaining their skills with traditional handtools. Workers with these new skills are increasingly called "service technicians." (Mechanics and service technicians who work on diesel-powered trucks, buses, and equipment are discussed in the